

Magnetism and Electromagnetism:

- Dipoles only
- Vectors:
 - $F_B \rightarrow$ magnetic force (N)
 - $B \rightarrow$ magnetic field (T)
 - $v \rightarrow$ velocity (m/s)
 - $I \rightarrow$ current (A)
 - $A \rightarrow$ area (m^2)

• Equations:

$$\vec{F}_B = q(\vec{v} \times \vec{B}) = qvB \sin \theta$$

Right-hand Rule

Thumb $\rightarrow F_B$

Index $\rightarrow v$

Middle $\rightarrow B$

$$\vec{F}_B = I(\vec{L} \times \vec{B}) = ILB \sin \theta$$

thumb $\rightarrow F_B$

index $\rightarrow L$

middle $\rightarrow B$

$$B = \frac{\mu_0 I}{2\pi r} \quad \text{Biot-Savart}$$

Second Right-hand Rule

thumb \rightarrow direction of current

fingers curl in direction of B-field

$$\Phi_B = BA \cos \theta \quad \text{units: } \text{Wb} = \text{T} \cdot \text{m}^2$$

$$\mathcal{E} = \frac{-\Delta \Phi_B}{\Delta t}$$

for solenoids:

$$\Phi_B = NBA \cos \theta$$

$$\mathcal{E} = -Blv$$



$$r = \frac{mv}{qB}$$